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Jean Dijon

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EXAMINER

PADGETT, MARIANNE L

ART UNIT

PAPER NUMBER

1715

NOTIFICATION DATE

DELIVERY MODE

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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/588,703	Applicant(s) DIJON ET AL.	
	Examiner MARIANNE L. PADGETT	Art Unit 1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/20/2010 & 11/18/2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6-10, 12, 20, 21 and 23-25 is/are pending in the application.
- 4a) Of the above claim(s) 3, 10, 12, 18 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-2, 6-9, 13-17, 21, 23-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. A **Request for Continued Examination** under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/20/2010 has been entered.

As indicated in the 12/8/2010 advisory concerning the 11/18/2010 after final submission, entered with this RCE, the amendments to the claims mostly corrected & clarified many of the support issues as were set forth in the 112 rejections of sections 3-5 of the action mailed 6/18/2010. However issues remain, since for example, while the language as set forth in independent claim 1, lines 12-15 may be found on page 3, lines 23-27, in what is essentially the Summary, this is a generalized statement relating to the deposition techniques employed in the Detail Description, but does not in and of itself providing enablement for performing the process with the broadly stated deposition procedure, in the process as claimed. See further discussion below. Applicant's amendment with respect to when the amended claims of relative surface tensions are present appears to derived from the sentence bridging pages 3-4, and while the original specification doesn't specifically say that the material to be divided is all on the support when these relatively compared surface tensions exist, but the claim language is a reasonable interpretation of this sentence's meaning due to the context, noting the "when" for the claim & the interpretation may be considered to include any time on the substrate during the process.

Applicants' amendment of the independent claims, removing the comprising language with respect to the layer of catalytic film, in combination with the requirements with respect to the material's catalytic capabilities, has overcome the **102(b)** rejection over **Raaijmakers et al.** (2003/0234417 A1), in section 8 of the action mailed 6/18/10, whose ALD (atomic layer deposition) process creates a layer of metal oxide, thus while the claim description of a sequence of deposits still reads on ALD processes, the overall claim process no longer reads on the specific teachings of this reference.

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The **102(b)** over **Merkulov et al.** (2002/0117951 A1) is overcome, since the claims as amended better described applicant's intent with respect to the sequence of deposits & waiting phases between deposits, which no longer encompasses these references e-beam evaporation using a resist mask, although is noted that the technique of Merkulov et al. is sufficiently similar to that of Ida Lee (WO) to provide for employing Ida Lee's techniques of initial deposition in a pattern employing vapor phase deposition techniques, which combination is not currently required, as while taught, no vapor phase deposition of catalyst material is ever claimed. Note that Merkulov et al.'s teachings being a vapor deposition process, also have relevance to the teachings of Raaijmakers et al. & Choi et al. (6,538,367 B1), due to discussions of overlapping deposition techniques & Choi et al.'s discussion of both catalytic metal deposition & their metal oxide particles, but presently applicants' claims do not require vapor deposition, so do not require such a combination. Applicants might consider claim limitations sufficient to make such reference combinations as noted above unnecessary (i.e. limit claim process to a scope that requires the exemplified techniques providing the examples' unexpected difference between the continuously deposited films versus the discontinuously deposited films, where as the examiner understands it, both sets of films as deposited before droplet formation treatment, were continuous films as illustrated in applicants figure 2).

The **102(e)** or, **103(a)** over **Keller et al.** (2005/0000318 A1) may reasonably be considered to be an overcome by the removal of the "comprising" language & requiring the sequence of deposits to be catalytic material not a precursor thereof..

2. **Claims 1-2, 6-9, 13-17, 21 & 23-25** are rejected under 35 U.S.C. **112, first** paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification has been reviewed with respect to the limitation of **claim 1**, lines 12-14, claiming "the layer of the **catalytic material** is formed by making a **sequence of deposits** of the catalytic

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material on to the surface of the substrate separated by **waiting phases** under a **vacuum** or in a **controlled atmosphere**" (emphasis added), with analogous limitations also in independent **claims 13 & 21**, which are similar to independent claim 1, but with varied limitations with respect to the surface on which the catalytic material is deposited.

With respect to this limitations meaning & scope in the context of the overall claim & as read in light of the specification, it is noted that the **catalytic material** is defined as being capable of catalyzing carbon nanotubes or carbon nanofibers, as is supported throughout the specification (e.g. page 1, line 3 in page 2, lines 9+; page 4, lines 15-31; page 6, line 8-12; Exs. 1-3, as related to the discussion on page 11, lines 3-15), with exemplary materials exhibiting this capability said to include nickel, cobalt or iron. Hence for the aspect of the claims with respect to the material being deposited, i.e. catalytic material, the specification provides appropriate enablement, with listing of exemplary metals. **However**, it is noted that **no teaching enabling using semiconductor materials as the claimed catalytic material** was found in the specification, because the teaching with respect to semiconductors found on page 12, is directed to the alternative nonelected species of obtaining particles of material (metallic or semiconductors) on the support, then oxidizing to form oxides such as metal oxide or silica. Therefore, while the catalytic material is enabled & dependent claims 6 & 24 amended to recite nickel, iron or cobalt, **claim 23** which is claiming generic semiconductors as the catalytic material for carbon nanotube or carbon nanofiber formation, appears to lack appropriate enablement for that claimed option of a semiconductor.

With respect to the limitations of a sequence of deposits of this claimed catalytic material "separated by waiting phases under a vacuum or a controlled atmosphere", it is noted that this encompasses any means of deposit, i.e. liquid depositions &/or powder depositions &/or vapor depositions, etc., of any thickness of claimed material, where the claimed "waiting phases" may be any length of time, i.e. a microsecond, a second, an hour, etc., and where "a controlled atmosphere" encompasses any type of control that is provided to any type of atmosphere, i.e. a room that has air

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conditioning has a controlled atmosphere. For example, applicants' deposition technique would read on pouring batches of molten metal (e.g. Ni, Fe, Co) on a support surface in a climate controlled room.

Therefore, the question is whether applicant's process **as claim**, is enabled for the scope of the types of deposition techniques applicants have claimed, i.e. do applicant's teachings enable forming of the deposited catalyst material layer into droplet shaped bodies to be performed on layers as encompassed by all possible thicknesses, deposition techniques, etc., as claimed. The generalized statement on page 3 of applicants' specification summarizing an aspect of useful deposition techniques, does not enable the claimed scope, and is clearly not presented in the specification for that purpose, but if read in context, which is not the same as that of the present claim language, first one notes that the paragraphs before and after the disclosure on page 3 also relate to the deposition, but specify that the deposit is a "thin layer" (relative term), but with page 3, lines 28-30 indicating this thin layer is normally in the form of the film with a thickness exemplified as between 1-10 nm. Therefore, clearly from context this teaching is not enabled to be employed in the scope of unlimited thicknesses as presently claimed, and it would not be reasonable to expect one of ordinary skill in the art to be able to employ it without undue experimentation on unlimited thicknesses as claimed.

It is further noted that with respect to the summarizing statements concerning depositing or deposits which are in "discontinuous form" (page 3, lines 18-27), that the only enablement for performing these operations is figure 1, its description on page 6, lines 1-page 7, lines 13 & Exs. 1-3. The taught device that provides enablement for discontinuous deposition of a very precisely controlled thicknesses of deposited layers uses the technique of electron gun evaporation, so as to have controlled discontinuous evaporation, with deposition time and non-deposition time. The examples are also employing discontinuous electron gun evaporation, with explicit examples of deposited layer thicknesses consistent with thicknesses on page 3, lines 28-30. Therefore, while these teachings provide enablement for discontinuous vapor deposition from a catalytic metal source, particularly exemplified by electron gun

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evaporation, they do not provide enablement regardless of deposition techniques, nor any indication that the significance of employing the particular discontinuous vapor deposition techniques would be relevant to any non-vapor deposition techniques. Thus, no reasonable person in the deposition art would consider this process enabled in the scope claimed, since there is no hint or reason to expect employing discontinuous deposition using absolutely any kind of deposition technique, to deposits films of any possible thickness, would have beneficial effects on droplet formation (or even be useful in such droplet formation) as comparatively shown in applicants' examples comparing continuous vapor deposition to discontinuous vapor deposition. While one of ordinary skill in the art would reasonably be expected to employ routine experimentation to employ different discontinuous vapor deposition techniques, than the specific electron gun vapor deposition, the teachings of the original specification provided no suggestion or means or even reason to expect or experiment with discontinuous deposition of all types of possible depositions, nor to apply this to unlimited thicknesses, especially considering that vapor deposition processes are generally considered thin film technology, where thin film as recognized in the art are of limited thickness ranges.

Therefore, for reasons as stated above, the claims as amended are not considered to be adequately enabled for performing the process in the scope as actually claimed. The examiner notes that one possible way of amending the claims so that they are commensurate scope with the enablement provided by the original specification might include, for example in claim 1, inserting after "atmosphere;" a phrase such as --wherein the sequence of the deposits are made using a system for evaporation of the catalytic material --, plus in the last line of claim 1 after "a film", inserting --having a thickness between 1 nm and 10 nm--. Independent claims 13 & 21 could be analogously amended.

Claims 1-2, 6-9, 13-17, 21 & 23-25 are rejected under 35 U.S.C. 112, **first** paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which

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was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

As discussed above, the specification lacks a teaching with respect to semiconductors being capable of catalyzing carbon nanotube or carbon nanofiber formation, thus **claim 23** that includes the option of employing semiconductors with this capability, encompasses **New Matter**, as this option is **New Matter**.

With respect to the limitations of "the layer of the **catalytic material** is formed by making a **sequence of deposits** of the catalytic material on to the surface of the substrate separated by **waiting phases** under a **vacuum** or in a **controlled atmosphere**" (**claim 1**, emphasis added), with analogous limitations also in independent **claims 13 & 21**, see above discussion with respect to enablement. It is further noted that while page 3, lines 23-27 provide support for the words as literally written, they do not provide support for the overall context in which they are claimed, as the original specification does not suggest the scope of the process has now claimed. It is further noted that the original claims not being directed to any sort of discontinuous deposition provide no further support. Thus while the claims as written encompass taught process procedures, they also encompass procedures that are neither taught nor suggested, so in the claims' current broad context are considered to encompass **New Matter**. The examiner notes that the above suggested claim language is also believed by the examiner to provide sufficient context supported by the original specification to remove this rejection.

3. **Claims 21 & 24** are rejected under 35 U.S.C. **112**, **second** paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent **claim 21**, line 7 has been amended to read "the surface of the substrate does **not interact** with the layer of the catalytic material when the layer of the catalytic material is formed on the surface of the substrate" (emphasis added), however "interact" is a very broad terminology that

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encompasses the catalytic material being on the surface, as this is a form of interaction. On page 4, lines 2-14, the original specification provide support for this amendment, but does not actually providing necessary definition of "interact" or its negative, however it does provide examples of what is prohibited in parentheses stating "It is also preferable if these materials do not interact together or interact only slightly (few diffusion phenomena, few or no chemical reactions)", hence while one may conclude that "does not interact" excludes diffusion & excludes chemical reactions, what else might be considered interacting cannot be clearly determined, since having interface with the surface or having effects caused by different surface tensions is a form of interaction, but excluding these interaction would exclude the entire process. Therefore, the scope of this terminology in the claims cannot be fully & necessarily determined. For example, in **Jin** (7,820,064 B2), note that the process as depicted on the cover of the patent & Jin's claimed annealing step are describing an interaction between the coating in the underlying surface, where annealing causes the layer to retract, which action is similar to forming droplet shaped bodies by annealing in applicants' process, but if interactions are all prohibited, this sort of interaction which forms the required bodies is also prohibited.

4. The following is a quotation of the appropriate paragraphs of **35 U.S.C. 102** that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of **35 U.S.C. 103(a)** which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names **joint inventors**. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The **nonstatutory double patenting rejection** is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. **Claims 1-2, 6, 8-9, 13-14, 16-17, 21 & 23-24** are rejected under 35 U.S.C. **102(b)** as being anticipated by, or alternatively under 35 U.S.C. **103(a)** over **Ida Lee** (WO 03/027011 A2).

The independent claims have been amended to require that the layer of catalytic material is in "the form of a film", however "film" is actually a very broad term encompassing many shapes from continuous films to discontinuous films. In other words, a patterned film is still a film, thus a film made

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of a series of discrete spots of metal catalysts, is a film, whether or not the terminology is employed in the teaching. While applicants may not intend a patterned film, as indicated by their discussion in their remarks on page 13 of the 11/18/10 submission, and may have intended a film such as in the specification's examples or illustrated in figure 2 (ref #14, layer of catalyst), the claims as written are not so limited, thus the claimed language still encompass a discontinuous film deposited via discontinuous deposition as disclosed in either **Ida Lee** (WO 03/027011 A2) or **Merkulov et al.** (2002/0117951 A1). The teachings of these references would be overcome by an amendment such as in claim 1, last line changing "a film" to -- a continuous film --, which would be supported by figure 2, ref #14.

Note with respect to "the layer of catalytic material is formed by making a sequence of deposits of the catalytic material to the surface of the substrate separated by waiting phase under a vacuum or in a controlled atmosphere", while **Ida Lee** (WO)'s illustrate the formation of a single catalyst tip in figures 5 & 6, discussed on page 8, lines 8-17, or on individual tips of cantilevers, with electrolytic deposition of a discrete spot of metal catalysts (33) via taught short electrical pulses delivering a controlled number of atoms; **Ida Lee**'s disclosure also discusses multiple tips (i.e. page 8, lines 31-32), deposition on silicon substrates (page 10, lines 14-19 & figure 7), deposition of arrays of catalysts & single carbon nanostructures on cantilevers substrates (example II, page 13, line 15+), the techniques used for mass production of catalyst dots (page 14, line 4+) with specific exemplary discussion of using the taught process for micrometer & nanometer fabrication of any device requiring controlled placement of carbon nanostructures on contacted tips or on nanometer structures in general. The specific example (figure 10 & page 14, line 30-page 15, line 13) suggests the process use for creating multiple pairs of nano electrodes (#s 73+75) on a silicon substrate (71) using multiple nanodot catalysts (33) using the techniques described for creating single nanodot catalysts (discussed below), thus clearly reading on three separate depositions, spaced in time, forming a layer with patterned deposits at separated desired locations. Also, the deposition of catalyst dots are performed in reaction chambers, As illustrated in Fig.

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6, described on page 7, lines 14-18, therefore the atmosphere is controlled due to at a minimum its confinement in the chamber, thus the teachings of Ida Lee (WO) still read on encompassed meanings of applicants' new claim terminology.

As previously set forth, **Ida Lee** (abstract; figures, esp.5-9; p. 8, lines 10-21 & 28-32; p. 9, line 5-p. 12, line 24, esp. p. 9, lines 8-10 & 18-22 & 29-p. 10, line 4+ p. 11, lines 1-24+ p. 12, lines 9-19) teaches metal (**Ni**) catalyst induced growth of carbon nanotubes, where the catalyst may be deposited on a buffer layer that should reasonably be considered to be relatively nonreactive (e.g. titanium \equiv diffusion barrier layer & in order to act as a buffer layer should not be reactive, especially with page 10 line 17 teaching "relative inertness of buffer layer components to the catalyst dots") via in electrolytic deposition process that employs short (ns-ms) pulses of precisely controlled electric current in order to deposit 100-2500 atoms per pulse (i.e. a temporally discontinuous deposition process). Furthermore, Ex. I discusses annealing Ni/titanium dots on a silicon substrate at elevated temperatures, where an initially continuous, disc shape nickel catalyst deposits balls up, & separates into multiple smaller dots or retains a single dot structure, dependent on various process parameters (dot size, thickness, buffer material, catalyst material, etc.). Carbon nanotubes structures are formed on the balled up nickel dots via a CVD process, such as one employing a mixture of acetylene & ammonia-helium. Note that the teaching of the annealing (heat treatment) causing balling up is consistent with meanings/context for "separating the layer... into droplet-shaped bodies... adhered to the substrate" now required by applicants' claim language. Note that this process may also be considered to provide controlled shape, therefore controlled roughness.

The independent claims 1 & 13 have been amended (11/18/10) to particularly specify the surface tension of the support surface is lower than the surface tension of the layer of catalytic material formed on that surface, and while Ida Lee (WO) does not discuss relative surface tensions, the reference does discussed what happens when catalytic metal is deposited on the support surface, or on the buffer layer, specifically a dot is formed, which "balls up", becoming generally hemispherical in shape during the

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subsequent plasma heating process, which effect would reasonably indicate a difference in surface tensions of the materials, as it is a known property of surface tension that lower relative surface tensions create beading effects, while higher relative surface tensions promote spreading effects. Therefore, the taught procedure & effects reasonably suggest that the claim surface tension relationship is present when the catalytic material is all on the surface. Alternatively, it would've been obvious to one of ordinary skill in the art, given the teachings on initial deposition pattern & subsequent reshaping into a hemispherical shape during plasma heating, to optimize surface conditions in order to facilitate & optimize parameters for the taught shape transformation.

6. It is noted that **Merkulov et al.** (2002/0117951 A1) remains of interest, especially with respect to the overlapping techniques with the above discussed Ida Lee (WO). Specifically, **Merkulov et al.** (951) discuss creating their deposition of catalyst (**Ni**) dots via use of a resist mask having openings with diameter D, where electron beam evaporation of the catalyst metal deposits a coating on a buffer layer in the resist openings, as well as on the surface of the resist, which coated resist is then lifted off the substrate, thus creating multiple dots or pattern array of dots on the substrate ([0026]), i.e. a patterned layer consisting of multiple separated layers, where the process of producing this is done over a period of time, which reads on possible meanings of applicants' new claim language.

As previously set forth, **Merkulov et al.** ((951): abstract; figures, esp. 1-2; [0023-31], esp. [0026-27 & 31]) teach growth of carbon nanotubes employing a catalytic precursor, such as Ni or other metals such as Fe or Co as catalyst, where catalyst nanoparticle(s) are formed, such as by employing an electron beam lithography process with electron gun evaporated metal on to a buffer layer, exemplified by Ti, which prevents diffusion of catalyst & catalyst silicide formation. The deposited layer may be a discontinuous deposition via use of a resist layer to form a multiple dots or patterned arrays of dots. (Note this discontinuous deposition still reads on the terminology employed in the claims, rather than the more specific definition applied to different language in the specification or the example therein.) Before use as

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catalyst for forming the carbon nanotubes, the Ni/Ti may be plasma pre-etched in ammonia or hydrogen gas, & annealed at elevated temperatures (e.g. 700°C), where the titanium layer continues to adhere to the silicon substrate & where the initially continuous nickel layer thereon breaks into one or more little nanoparticle droplets (e.g. \equiv drops). Thereafter, carbon nanotubes are grown on the nanoparticle catalyst in a vertical direction via use of acetylene & ammonia gas mixtures.

7. **Claim 25** are is rejected under 35 U.S.C. **103(a)** as being unpatentable over **Ida Lee** (WO), as applied to claims 1-2, 6, 8-9, 13-14, 16-17, 21 & 23-24 above, and further in view of **Lee et al.** (EP 1061041 A1).

While **Ida Lee** (WO) teach buffer layers (e.g. diffusion barrier layer), such as Ti, W, Mo or W-Ti alloys, to prevent interaction (nickel silicide, etc.) between a substrate (Si) & the deposited catalyst (Ni, Co or Fe), or **Merkulov et al.** provides analogous teachings as discussed above, neither **Ida Lee** (WO) nor **Merkulov et al.** particularly specify TiN nor oxides as their intervening/buffer/barrier layer, however **Lee et al.** (EP), who is also employing metal catalyst, such as Ni, Co, or Fe deposited via common thermal deposition, e-beam deposition or sputtering, then post-treated to be in nanoparticle form, as a catalyst for CVD deposition of carbon nanotubes; provides analogous teachings of employing intervening layers to prevent interaction between substrate and catalytic metal, where those intervening layers may be insulating film, such as **silicon oxide** or **alumina**, or metal films said to include **Ti**, **titanium nitride**, Cr or W. Thus Lee et al. (EP) is teaching the equivalence of Ti, & TiN or insulating oxide films, as barrier layers to prevent interaction between substrate & catalytic Ni in analogous processing steps, hence it would've been obvious to one of ordinary skill in the art to employ titanium nitride or silicone or alumina as alternative buffer layer materials to the taught metals of either primary reference, such as titanium, with a reasonable expectation of equivalent effectiveness due to their shown equivalence for like purposes.

8. As previously noted, **Teo et al.** ("Field emission from dense, sparse & pattern arrays of carbon nanofibers"): abstract; & 4th-5th paragraphs) provide equivalent teachings to those provided in

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Lee et al. (EP) in teachings options for diffusion barrier layers, including SiO₂ or TiN used with Ni catalyst for growth on Si substrates, performing CVD carbon nanofiber structures.

9. **Claims 7 & 15** are rejected under 35 U.S.C. **103(a)** as being unpatentable over **Ida Lee** (WO), as applied to claims 1-2, 6, 8-9, 13-14, 16-17, 21 & 23-24 above, and further in view of **Choi et al.** (6,538,367 B1).

Ida Lee (WO) does not provide teachings that would indicate the presence of any oxygen in during the deposition of their catalytic material. However, **Choi et al.** is also directed to techniques for depositing catalytic material that is to be employed for catalyzing carbon nanotube or nanoconductor formation, providing multiple alternatives for means of providing catalytic material (col. 5, lines 63-col. 7, line 41), mentioning that fine nanoparticles of iron, cobalt, nickel or their oxide particles are effective as catalyst for nanoconductor nucleation in growth; that deposition of metal catalyst (e.g. Fe, Co, Ni) thin films may be via CVD, electrochemical deposition or physical vapor deposition (PVD) techniques, with subsequent heating to cause particulate formation; that employing porous substrate material & short duration vacuum deposition techniques or electrochemical means to selectively fill catalyst particles into the porous substrate's surface; etc., are effective means for supplying catalyst; hence it would've been obvious to one of ordinary skill in the art that for **Ida Lee's** electrochemical deposition techniques [or for **Merkulov et al.**'s electron evaporation technique (i.e. a PVD technique)], that the presence of some partial pressure of oxygen would reasonably have been expected to provide no harmful effects, & would still have been expected to provide catalytic material even if oxide materials were formed, as the oxides of the taught metal particles of the primary reference's would also have been expected to have catalytic properties for carbon nanotube construction. It is further noted that since a presence of a partial pressure of oxygen, includes **any partial pressure of oxygen**, no matter how minuscule or how large, and as the claimed limitation with respect to oxygen partial pressure does not require any results from the presence of a partial pressure of oxygen, this claimed limitation may also be considered to include very low partial

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pressures that may result from evacuation of the atmosphere which are typically used in PVD techniques as taught by Choi et al. [or Merkulov et al.], or would include whatever atmosphere is in the chambers as illustrated by Ida Lee (figure 6), whether they have been evacuated or not (not specified). As previously noted the relevant deposition processes deposit metal & do not result in metal oxide deposits, thus further providing a reasonable expectation of the presence of at least some partial pressure of oxygen as claimed in any PVD or electrochemical deposition process for catalytic metal deposition, since the vacuums produced are not absolute vacuums & Ida Lee's atmosphere contain their chambers is not specified but reasonably would have been expected to contain oxygen residues of some partial pressure, thus would have residual gas molecules inclusive of oxygen molecules.

10. **Claims 1-2, 6 & 8-9** are rejected under 35 U.S.C. **102(b)** as being anticipated by, or alternatively under 35 U.S.C. **103(a)** over **Gao et al.** ("Plasma breaking of thin films into nano-sized catalyst for carbon nanotubes synthesis").

Gao et al. (abstract & experimental procedure) teach using PLD (pulsed laser deposition) of catalytic metal (Fe) to deposit a Fe film as illustrated in figure 1(a) that is about 200 nm thick, where the pulse parameters employed used a pulsewidth of 5 ns & a repetition rate of 10 Hz (i.e. cycles per second), therefore each cycle was 6 seconds, with the energy being supplied for 5 ns of that cycle to supply laser light to vaporize Fe source material; thus reading on a sequence of vapor depositions caused by the pulses of laser, where the waiting periods are the times between ablation/vapor plumes from the laser pulses impinging on the substrate surface, as such a mechanism would have been inherent in the use of the PLD process using the taught parameters. Also see "3. Results and discussion", where in the first paragraph thereof discusses the ablated iron plume adhering to the substrate to result in a uniform film.

Alternatively, it would've been obvious to one of ordinary skill in the art given the teaching of employing PLD, that such mechanism was occurring, where it would've been further obvious to one of ordinary skill in the art that the substrate being deposited on would have been required to be close enough to the PLD

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process's source material that such a mechanism would have occurred, in order to produce the taught depositions. Note that the pressure in the deposition chamber was taught to be 0.003 Torr, thus is both under vacuum & a controlled atmosphere. It is further noted that since the substrate was transferred in air to the PLD chamber & it is not an absolute vacuum that has been employed in the process, there would have been some very small partial pressure of oxygen below the taught at 0.003 Torr present in the chamber.

After forming the Fe film on the Si supports substrate, this coated substrate was put in a microwave plasma chamber, where an initial hydrogen plasma was employed, then the gas was changed to nitrogen, with plasma power between 700-900 W applied at 15 Torr gas pressure to cause heating of the substrate to between 600 & 900°C for 3 different treatment times to provide resultant iron catalyst structures as illustrated in figures 1b, 1c & 1d, which as illustrated are considered to read on applicants' droplet shaped bodies. Thereafter, optimally iron catalyst preparations were used to synthesize CNT using methane gas, thus via CVD process.

Therefore, Gao et al. provides teachings with respect to deposition of metal catalyst material fragmented into drops via post-deposition treatment processes, which are deposited via a temporally discontinuous pulsed technique, although the teachings lack discussion with respect to surface tensions or reactivity of the silicon substrate & Fe layer deposited thereon. As the discussed results indicate the iron vapor from the ablation plume adhering to the substrate, but not forming iron silicides, one might conclude that under the deposition conditions the substrate & deposition material are not considered reactive, but such chemical reactions cannot necessarily be excluded by the PTO that lacks the ability to test, so it cannot be said definitively that no chemical reactions occur under the conditions discussed by Gao et al. With respect to the Fe layer formed on the surface of the silicon substrate, the PTO cannot measure the surface tensions of either, however since during the plasma heating process, Gao et al. test for optimal plasma conditions for breaking the Fe layer into appropriate catalyst structures, where when

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conditions are optimized (i.e. not so long or so hot as to melt the film), the formation of separated individual grains (i.e. droplet shapes) occurs, it is reasonable to conclude that at least during these formation times & immediately preceding them when this breakup is occurring that the claimed surface tension relationship (i.e. substrate surface having lower surface tension than layer formed in thereon) would be true in order to enable the breakup to occur. How long before this such a relationship existed, or if it exists before heating, cannot be determined by the PTO, which has no way to determine when the cohesive forces of the Fe layer itself were overcome by the forces induced by the plasma & its heating effects that would reasonably have been expected to include forces of surface tension pulling the layer apart into grains.

It is noted that Gao et al. uses a different type of discontinuous vapor deposition in applicants' example & deposits significantly thicker films, however none of these differences are relevant to the claims as presently written. Also, due to the redundancy of this rejection no 103 rejection, such as with respect to barrier layers, etc. & the Gao et al. process need be made at this time.

11. **Claims 1-2, 6-9, 13-17, 21 & 23-25** are provisionally rejected on the ground of **nonstatutory obviousness-type double patenting** as being unpatentable over claims 14-30 of copending Application No. **10/546,284**, in view of **Ida Lee (WO)** or **Gao et al.** ("Plasma breaking of thin films into nano-sized catalyst for carbon nanotubes synthesis").

The copending application (284) claims are directed to overlapping scope claimed in different orders & employing different language, however both sets of claims are depositing material (may be Ni) on the support (may have titanium nitride barrier layer thereon), where the present application claims describes deposition of the material \equiv catalyst layer as "for formed by making a sequence of deposits of the catalytic material to the surface of the substrate separated by waiting phases under a vacuum or in a controlled atmosphere", which is different from the copending (284)'s claims of patterning the deposit via use of a mask during deposition {analogous to the process of Merkulov et al. (951) discussed above}.

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However, both sets of application claims may employ the same catalytic material & same barrier layer material, surface tension & reactivity relationships may be considered equivalent to. Also, both cases specified that the catalyst may be post-treated, with the present case specifying "separating the layer of the catalyst material into droplet-shaped bodies... adhered to the substrate" via the elected process of heat treatment, while the copending case claims "annealing...to obtain a fractionation of the layer of the catalyst in the shape of drops", thus while employing different language, are presenting overlapping concepts, since annealing is a heat treatment, etc. While the copending case, when claiming carbon nanotubes growth on a catalytic drop structure, does not particularly specify that the process is via vapor deposition, it would've been obvious to one of ordinary skill in the art to employ vapor deposition in the claimed carbon nanotube growth process, as the catalytic structure claimed for the nanotube growth would reasonably have been expected to be employed in a vapor process in order to provide selectivity as claimed, especially considering common techniques for such carbon nanotube growth are generally CVD techniques. Alternatively, considering above discussed **Ida Lee(wo)**, or **Gao et al.**, who both employ catalysts of equivalent shape formed by analogous techniques to grow CNT structures via chemical vapor deposition, the above stated obviousness is demonstrated.

Considering the presently claimed "sequence of deposits...", which is read on by the above discussed references of **Ida Lee**, or **Gao et al.**, it would've been obvious to one of ordinary skill in the art, to employ such deposition techniques for the generic deposition of a catalytic layer of material of the copending claims, as these claims do not specify any particular means of deposition, thus one of ordinary skill would have been expected to employ techniques known to be effective in analogous art, such as Ida Lee or Gao et al. Furthermore, both of these references also when teaching their carbon nanotubes synthesis on the fragmented catalytic material, particular specify CVD growth conditions for producing the carbon nanotubes, thus supporting the above assertion with respect to the obviousness of employing CVD techniques with fragmented or particulate catalytic layers.

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Note with respect to the presence of a partial pressure of oxygen during the deposition, which requires no specific partial pressure, nor any effective from the partial pressure of oxygen, that it may be considered that virtually any process as discussed above that is performed on earth, even if vacuum deposition conditions are employed, will have some partial pressure of oxygen, even if it is extremely small, as absolute vacuum is not employed, so some very small partial pressure of air would have been expected to be present & air has itself a partial pressure of oxygen.

This is a provisional obviousness-type double patenting rejection.

12. **Claims 1-2, 6, 8-9, 13-14, 16-17, 21 & 23-24** are rejected on the ground of **nonstatutory obviousness-type double patenting** as being unpatentable over claims 1-21 of U.S. Patent No. **7,544,547 B2** (Fournel et al.), in view of **Gao et al.** ("Plasma... nano-sized catalyst...").

Claim 25 is rejected on the ground of **nonstatutory obviousness-type double patenting** as being unpatentable over claims 1-21 of U.S. Patent No. **7,544,547 B2** (Fournel et al.), in view of **Gao et al.** ("Plasma... in view of **Lee et al.** (EP).

The copending patent (547) to overlapping inventors is directed to a process having overlapping subject matter with the present claims, claimed employing varying nomenclature & varying orders, plus while having additional steps not presently required, these additional steps are also not excluded by the present set of claims, as currently amended. Particularly the copending claims only require generic deposition of a first material used for catalytic growth of nanostructured materials, where the nanostructures are organized periodically via fractionalization by heat treatment, which is considered equivalent & overlapping with the presently claimed nomenclature to create droplet shaped bodies. Also while the copending claims specify growth of nanostructures, they do not particularly specify that their nanostructures are carbon ones. It is also noted that while the patent claims do not use the terminology "thermal or diffusion barrier layer", they do claim the use of an intermediate layer deposited on the support surface, with listing of such materials inclusive of SiO₂, Si₃N₄, Al₂O₃, diamond, etc., which

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materials will effectively & inherently produce thermal &/or barrier properties depending on environmental exposure, as well as rating on the newly claimed oxide barrier layer option.

With respect to be the claimed "making a sequences of the catalytic material to the surface of the substrate separated by waiting phases...", **Gao et al.** (abstract & experimental procedure, using **pulsed laser deposition** of catalytic metal) provide teachings with respect to deposition of metal catalyst material intended to be fragmented into drops via post-deposition treatment processes, which are deposited via temporally discontinuous pulsed techniques, which may be considered to deposit catalytic material with each pulse as discussed above, therefore it would've been obvious to one of ordinary skill in the art, to employ such deposition techniques for the generic deposition of a catalytic layer of material of the copending patent (547) claims, as these claims do not specify any particular means of deposition but require deposition of a continuous layer which pulsed laser deposition is capable of supplying, thus one of ordinary skill would have been expected to employ techniques known to be effective in analogous art, such as Gao et al. Furthermore, Gao et al. is also teaching the use of their catalyst for particular nanostructures synthesis of carbon nanotubes synthesis on the fragmented material, particular specify CVD growth conditions for producing the carbon nanotubes, thus providing motivation for employing their taught CVD techniques with fragmented or particulate catalytic layers to produce such carbon nanotube structures.

With respect to the use of particular catalytic metal & deposited on particular underlying (diffusion barrier layer) material, the patent a claims may deposit their catalytic layer on an intermediate of material which may be silica or alumina, hence as discussed above Lee et al. (EP), in combination with Gao et al., provides for the obviousness of this specific combination of materials one particularly depositing carbon nanotubes, thus given taught equivalents (discussed above) of titanium nitride, with titanium or silica or alumina, and the desirability of using such titanium or titanium nitride barrier layers

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when specifically depositing carbon nanotubes on the catalytic material, thus it would've been obvious to use these specific materials for their expected effectiveness in the process.

See above discussion concerning oxygen partial pressure, which is also relevant here.

13. **Claims 1-2, 6-9 & 13-17, 21 & 23-24** are provisionally rejected on the ground of **nonstatutory obviousness-type double patenting** as being unpatentable over claims 25-42 of copending Application No. **11/915,238**, in view of **Ida Lee (WO) or Gao et al.** ("Plasma breaking of thin films into nano-sized catalyst for carbon nanotubes synthesis").

Claim 25 is provisionally rejected on the ground of **nonstatutory obviousness-type double patenting** as being unpatentable over claims 25-42 of copending Application No. **11/915,238**, in view of **Lee et al. (EP)**, & in view of **Ida Lee (WO) or Gao et al.** ("Plasma...").

The copending **application (238)** claims are directed to overlapping scope claimed in different orders & employing during language, however both sets of claims are depositing material that may be employed for catalytic CVD formation of nanostructures, where these materials are deposited on surfaces that may have diffusion barrier layers thereon & may be heat treated to cause fragmentation \equiv formation of droplet shaped bodies, as the copending application's language of increasing the temperature is synonymous therewith present process applying heat. Copending (238) provides generic claim limitations with respect to depositing means for their catalyst layer, however specifically relates to using resist structures for patterning to create a discontinuous deposit, thus is analogous to discussion of copending (284) in section 11 above, thus the teachings of **Ida Lee (WO) or Gao et al.** ("Plasma...") are applicable to copending (238) for reasons as discussed above with respect to copending application (284). The copending claims of (238) are silent with respect to specific barrier layer material or specific catalytic material, however the specific materials of nickel & titanium nitride used in the claimed catalytic processes would've been obvious given the teachings of **Lee et al. (EP)** for reasons as analogously

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discussed in sections 7 or 12 above. Also note above relevant discussions with respect to carbon nanotubes versus nanostructures & partial pressure of oxygen.

This is a provisional obviousness-type double patenting rejection.

14. **New art of interest includes:** **Esconjauregui et al.** (2010/0285656 A1) having teachings of interest of depositing consecutive layers of silicon, then metal, annealing to form metal silicide nanoparticles, where barrier layer used to prevent the deposits from diffusing into the substrate are employed (note these teachings suggest that some metal silicide might have occurred, even if not mentioned in Gao et al.); **Kaneko et al.** (7,892,316 B2) has a process of interest depositing powder on a surface & heating so as to form a fine metal particle layer, which is relevant to the claims as written, but is significantly different than the actual disclosed process; while **Nalamasu et al.** (2010/0313951 A1) & **Nagasaka et al.** (2010/0291297 A1) have further teachings of interest with respect to forming a catalyst layer of catalytic particles performing carbon nanotubes or carbon nanostructure growth.

Other art of interest previously cited included: **Samuelson et al.** (2005/0011431 A1 \equiv 7,608,147 B2 \equiv 2010/00354142 A1) that has teachings of forming nanowhiskers \equiv nanofibers (but metal nano whiskers, not carbon that ambiguously read on applicants' nanofibers) using arrays of masses of catalysts (e.g. gold) that are heated to form catalytic seed particles (i.e. droplets), with teachings concerning the **importance of wetting** at the interface, such that there is neither insufficient or too much wetting occurring between the substrate surface & the catalytic material during heating (abstracts & [0083-86] in (412) & [0082-85] in (431)), noting that the exemplary patterning techniques given may be masked deposition equivalent to that as discussed above with respect to Merkulov et al. (951), thus the Samuelson references are presently redundant to above rejections, but considered significant to applicants' possible intent with respect to their unclearly claimed surface tension limitations, since surface tension & wettability are discussing analogous properties & effects. Also, **Burke et al.** (7645482 B2 & 7718224 B2) & **Li et al.** (2009/0283735 A1), are not prior art, but have teachings of interest with respect

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to discontinuous deposition of films for creating nanoparticle catalyst for subsequent nano carbon depositions.

Other art of interest previously cited included: **Dominguez et al.**, ((575): abstract; figures; [0007-8]; [0011]; [0013-18, esp. 13 & 17-18]; [0020] & claims, esp. 1, 3-5 & 8-10), which teach deposition of a film containing active components that may be catalytic metals, such as nickel; & inactive components that may be Ti, Al, dielectric materials, e.g. oxides like titania, which is equivalent to **Dominguez et al.** (7,635,503 B2) issued from the same application; **Choi et al.** ("Density control of carbon nanotubes using NH₃ plasma treatment of Ni catalyst layer"), cited in the IDS, is of interest to the nonelected species of hydrogen-containing plasma pretreatment of a deposited material (Ni catalytic layer on Cr buffer layer), which issues that for catalytic growth of carbon nanotubes, & is equivalent to above applied references for the generic claims that do not specify require post-discontinuous deposition heat treatment, except it does not specify that the nickel is initially discontinuously deposited, either spatially or temporally; **Gao et al.** ("Plasma breaking of thin films into nano-size catalyst for carbon nanotubes synthesis"), also citing the IDS, is similar to Choi et al., except deposits Fe thin films via pulsed laser deposition, then employs a N-plasma to break the thin film into uniform nano-size catalyst particles; **Ota** ("specific conditions for Ni catalyze carbon nanotubes growth by chemical vapor deposition") while teaching the post metal deposition heat treatment to control nickel particle sizes, deposits via CVD without teachings of any discontinuous manners; **Cotell et al.** ("Microstructural development of thin films grown by pulsed laser deposition"), cited in the IDS, shows that use of pulsed laser deposition versus other vapor deposition processes (i.e. a temporally discontinuous deposition process versus continuous) does not have any significant effect on the produced microstructure for a range of taught substrates & substrate temperatures, which indicates that applicants lack of operational/parameter details with respect to their temporally discontinuous deposition is a significant flaw in the disclosure.

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Further art of interests includes: **Dai et al.** (WO 00/30141), who also teach patterned catalytic layers for vapor depositing carbon nanotubes, where the catalytic material may be a patterned film made using e-beam evaporation of iron through a shadowmask, with subsequent annealing in air to create patterned iron oxide catalyst; **Legagneux et al.** (WO 03/048040 A1), whose English abstract indicates relevant teachings concerning catalytic layers on a diffusion alloy barrier film, for use in catalytic growth of nanotubes/nanofibers; **Shin et al.** (2002/0014667 A1), who teach control of shape & size of catalyst pattern in order to control growth of carbon nanotubes, including discontinuous deposition the use of a mask, which may be removed after catalyst deposition by heating, however they are interested in depositing carbon nanotubes in a horizontal direction, thus deposited film does not provide any "drop" shapes after heating; **Kishi et al.** (2003/0098640 A1) provides teaching concerning metal thin film formation via vacuum evaporation or CVD, with subsequent heating to agglomerate catalytic sites, forming discontinuous film surface, where subsequent heating in oxygen atmosphere will catalyze reactions to process carbon nanotubes via oxidation (as opposed to form them); while **Hirasawa et al.** (2002/0171347 A1), **Simpson et al.** (2002/0024279 A1), **Geohegan et al.** (2006/0279191 A1), **Huotari et al.** (2009/0246367 A1 & 7491634 B2) & **Cheng et al.** (2002/0163287 A1), all provide further teachings concerning the use of catalytic metal layers used in the formation of carbon nanotubes.

Also noted of interest, are copending cases **12/412,497**, **12/004,883** & **11/174,537** to at least overlapping inventors that have claims directed to be relevant processes for catalytic formation of nanotubes or nanostructures, but presently do not necessitate an obviousness double patenting rejection.

15. Applicant's arguments filed 11/18/10 & 12/20/10, discussed above have been fully considered but they are not persuasive.

16. **Any inquiry** concerning this communication or earlier communications from the examiner should be directed to **Marianne L. Padgett** whose telephone number is **(571) 272-1425**. The examiner can normally be reached on M-F from about 9:00 a.m. to 5:00 p.m.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marianne L. Padgett/
Primary Examiner, Art Unit 1715

MLP/dictation software

3/18/2011